Angle-dependent Magnetoresistance Oscillations and Magnetic Breakdown in α-(BEDT-TTF)$_2$KHg(SCN)$_4$

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A quasi-two-dimensional (Q2D) organic conductor, α-(BEDT-TTF)$_2$KHg(SCN)$_4$, has a pair of sheetlike Fermi surfaces (FSs) and a cylindrical FS at room temperature. At $T_c \approx 8$ K, the system undergoes a phase transition from metallic to an insulating charge density wave (CDW) state. Although in the CDW phase where no quasi-one-dimensional (Q1D) FS sheet should survive, there appear clear angle-dependent magnetoresistance oscillations (AMRO) similar to the Lebed resonance, which is characteristic to Q1D FS. Over the years several models have been proposed [1, 2], however the origin of the novel AMRO is not still confirmed.

In order to investigate the anomalous Lebed resonance, we have performed stereographic measurements of interlayer magnetoresistance in α-(BEDT-TTF)$_2$KHg(SCN)$_4$ with changing temperature from 2 K to 10 K across T_c. In this system, the electron orbital motion on the FS reconstructed by the CDW potential should be modified by the magnetic breakdown through the CDW gaps, which can be controlled by the temperature. At 2 K in the CDW phase, there exists the anomalous Lebed resonance pattern, the amplitude of which is modulated by Danner-Chaikin oscillations in case of applied magnetic field close to the Q2D conducting plane (Fig.1). On the contrary, just below T_c in the CDW phase, we have found that the Kajita oscillation of the cylindrical FS appears superposed on the anomalous Lebed resonance. These results suggest that magnetic breakdown plays a key role in anomalous AMRO behaviors in the title compound.

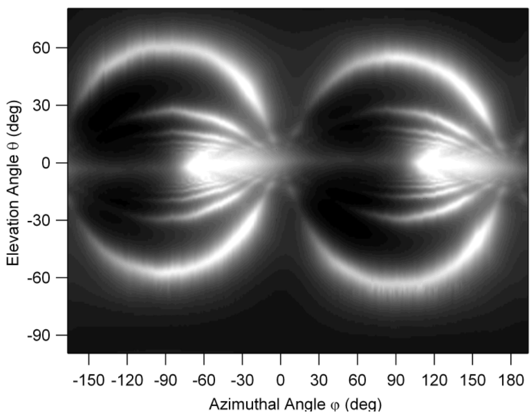

Fig.1 Stereographic image of interlayer conductivity in α-(BEDT-TTF)$_2$KHg(SCN)$_4$ as a function of magnetic field orientation.

[1] M. V. Kartsovnik et al., Journal de Physique I France 3, 1187 (1993).
[2] K. Maki et al., Phys. Rev. Lett. 90, 256402 (2003).